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EQUIPMENT FOR GEOGRAPHY TEACHING

THE list of equipment for geography teaching in Elementary and Normal schools, seen below, is based on an exhibit recently held at Teachers College, Columbia University, and to which generous loans were made by publishers and map agents.

CONTINENTAL AND WORLD MAPS

Johnston Series, exhibited by W. B. Harison, New York City:

- World, showing possessions of United States.
- North America.
- North America (International Series).
- United States and Mexico.
- Physical Map of the World.
- Physical Map of United States and Mexico (Grand Series).
- Physical Map of Europe.
- Imperial Map of World in Hemispheres.
- World, Mercator Projection (International Series).
- Commercial Chart of the World.
- British Isles.
- Also similar Maps of Asia, Africa, South America and Australia.

Excelsior Series, exhibited by J. L. Hammett Co., New York and Boston:

- North America.
- United States and Mexico.
- World, Mercator Projection.
- South America.
- Asia.
- Europe.
- Africa.
- Australia.
- Also same maps in outline without names.

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Peerless Maps, exhibited by Scarborough Company, Indianapolis:
- North America.
- South America.
- Europe.
- Asia.
- Africa.
- Australia.

Columbia Series, exhibited by Rand, McNally & Co., Chicago:
- North America.
- United States.
- Germany.
- British Isles.
- World, Mercator Projection.
- Australia and Polynesia.
- Africa.
- Asia.
- South America.

Series of maps of individual continents in portable case, exhibited by Rand, McNally & Co., Chicago:

France, Hachette & Co., exhibited by Scarborough Co., Indianapolis.

Europe, Philip's Schoolroom Map, exhibited by W. B. Harison, New York.

World, Philip's Schoolroom Map, exhibited by W. B. Harison, New York.

Roman Empire, exhibited by Rand, McNally & Co., Chicago.

Relief Map of Rhine, Koehler, Leipzig.

Bamberg's Map of Africa, exhibited by the Scarborough Co., Indianapolis.

Habenicht-Sydow Physical Maps, exhibited by J. L. Hammett Co., Boston and New York:
- North America.
- Europe.
- Asia.
- Africa.

Chart of World, Mercator's Projection. Justus Perthes, Gotha, Germany.

Maps of New York and Vicinity:
- New York City (large wall map), exhibited by C. S. Hammond, New York.
- Montauk Point to New York, U. S. Coast and Geodetic Survey.
- Geological Map of New York, New York State Museum.

Waterworks System of Long Island, U. S. Geological Survey.
New York City and Vicinity, U. S. Geological Survey.
Geological Map New York City and Vicinity (from New York City Geologic Folio), U. S. Geological Survey.
View of New York and Vicinity, W. B. Harison.
Educational Map of New York City, A. L. Smith.
Topographical Map of Eastern New York and Western Connecticut, made by mounting together individual sheets of U. S. Topographic Maps.

Miscellaneous Maps:

Mississippi River from Cairo to Gulf, Mississippi River Commission.
Monthly Pilot Chart of North Atlantic, U. S. Hydrographic Office.
Weather Map, Weather Bureau, U. S. Department of Agriculture.
Straits of Magellan, made by mounting together maps of U. S. Hydrographic Office.
U. S. Topographic Map, 100 feet Contours, U. S. Geological Survey.
Same map used as base map for showing Standard Time Divisions.
Same map used as base map for showing Physical Divisions of U. S.
Principal Transportation Routes of World, Bureau of Statistics, Department of Commerce and Labor.
Land Office Map of California.
Outline Map of World, used as base for showing distribution of Rainfall.
Outline Maps, exhibited by D. C. Heath & Co.; Longmans, Green & Co.; W. B. Harison; Atkinson, Mentzer & Grover.

Relief Models:

South America, E. E. Howell, Washington.
Africa, E. E. Howell, Washington.
New York, E. E. Howell,Washington.
New York Harbor, Lower Bay Entrance Channels, E. E. Howell, Washington.
Eurasia, E. E. Howell, Washington.
North America, E. E. Howell, Washington.
New York and Vicinity, E. E. Howell, Washington.
Australia, E. E. Howell, Washington.
Harvard Geography Models, Ginn & Co.,
Mountains Bordering the Sea.
Coastal Plain and Mountains.
Embayed Mountains.

United States, showing restoration Ancient Ice Sheet, E. E. Howell, Washington.
Relief Map United States, showing Annual Rainfall and Temperature, E. E. Howell, Washington.
Volcanic Island, A. Heim, Wurster & Co., Zurich.
Model of Seashore, A. Heim, Wurster & Co., Zurich.
Model of River Valley, A. Heim, Wurster & Co., Zurich.
Use of Contours, H. Keeler, Central Scientific Co.
Mt. Shasta, H. Keeler, Central Scientific Co.
Niagara River and Vicinity, H. Keeler, Central Scientific Co.

Globes, Political, Rand, McNally & Co., Chicago.
Globes, Political, Johnston, W. B. Harison, New York City.
Globes, Political and Physical, C. S. Hammond, New York City.
Globes, Blackboard, C. S. Hammond, New York City.

Atlases:

Hand Atlas, Stieler, J. Perthes, Gotha.
Hand Atlas, Andrees, Velhagen & Klasing, Leipzig.
Success Handy Reference Atlas and Gazetteer of the World, G. F. Cram, Success, New York.
Physical Atlas, Meteorology, Vol. III, Bartholomew.
World Wide Atlas, Johnston, London.
Atlas of the World's Chief Industries, G. Philip & Son, London.
Atlas of Commercial Geography, R. F. Savage, Johnston, London.
Modern School Atlas, R. F. Savage, Johnston, London.
Model Atlas, R. F. Savage, Johnston, London.
Systematic Atlas, Ravenstein, Johnston, London.
New School Atlas: Chisholm & Leete; Longmans, Green & Co.
Dollar Atlas of the World, Rand, McNally & Co.
London School Board Atlas, G. Philip & Son.
Elementary Atlas of Comparative Geography, G. Philip & Son.
Schul Atlas: Keil & Riecke; Hofmann, Gera.
London School Atlas: Arnold-Forster; London School Atlas Co.
Indexed Atlas of the World, Rand, McNally Co.
United States.
Foreign Countries.
Universal Atlas of the World, Rand, McNally Co.

Gazetteers:

Gazetteer of the World: Chisholm; Longmans, Green & Co.
Lippincott's Gazetteer: Heilprin; J. B. Lippincott & Co.

Elementary School Texts

Tarr & McMurry's Geographies, 5 Book, 3 Book, 2 Book Series: The Macmillan Company.

Dodge Geographies, 2 Book, 4 Book Series: Rand, McNally & Co.

Natural Elementary Geography, J. W. Redway, American Book Co.

Natural Brief Geography, J. W. Redway & R. Hinman, American Book Co.

Natural Advanced Geography, J. W. Redway & R. Hinman, American Book Co.

Illustrated School Geography, A. J. Herbertson, Edward Arnold, London.

Elementary Geography, C. F. King, Chas. Scribner's Sons.

Elementary Geography, H. J. Roddy, American Book Co.

Complete Geography, H. J. Roddy, American Book Co.

Elements of Geography, A. E. Frye, Ginn & Co.

Grammar School Geography, A. E. Frye, Ginn & Co.

Longmans' Geography: Chisholm & Leete; Longmans, Green & Co., London.

Periodicals

Scottish Geographical Magazine, Scottish Geographical Society, Edinburgh.

The Geographical Teacher, edited by A. J. Herbertson, G. Philip & Son, London.

National Geographic Magazine, National Geographic Society, Washington, D. C.

Bulletin of the American Geographical Society, New York City.

The Journal of Geography, New York.

Annales de Géographie, Armand Colin, Paris.

Bibliotheca Geographica, Gesellschaft für Erdkunde, Berlin.

Secondary School Texts, Physical and Commercial Geography and Geology

Eclectic Physical Geography, R. Hinman, American Book Co.

Elementary Lessons in Physical Geography, A. Geikie, Macmillan & Co., London.

Science Primers, IV Physical Geography, A. Geikie, Appleton.

First Book of Physical Geography, R. S. Tarr, The Macmillan Company.

Elementary Physical Geography, R. S. Tarr, The Macmillan Company.

New Physical Geography, R. S. Tarr, The Macmillan Co.

New Physical Geography, E. J. Houston, Hinds, Noble & Eldredge.

Elementary Physical Geography, J. W. Redway, Chas. Scribner's Sons.

Introduction to Physical Geography, Gilbert & Brigham, Appleton.

Lessons in Physical Geography, C. R. Dryer, American Book Co.
Revised Text Book of Geology, J. D. Dana, American Book Co.
Elements of Geology, W. H. Norton, Ginn & Company.
Compend of Geology, J. LeConte, American Book Co.
The Realm of Nature, H. R. Mill, Chas. Scribner's Sons.
Elementary Physical Geography, W. M. Davis, Ginn & Company.
Commercial Geography, J. W. Redway, Chas. Scribner's Sons.
Commercial Geography, L. W. Lyde, A. & C. Black, London.
Commercial Geography of the British Isles, A. J. Herbertson, W. & R. Chambers, London.
Commercial Geography of the World Outside of the British Isles, A. J. Herbertson, W. & R. Chambers, London.
Elementary Commercial Geography, C. C. Adams, Appleton.
A Commercial Geography, C. C. Adams, Appleton.
Geography of Commerce, S. Trotter, The Macmillan Company.
Commercial Geography, Gannett, Garrison & Houston, American Book Co.
Handbook of Commercial Geography, C. G. Chisholm, Longmans, Green & Co.
Laboratory Manuals:
- Observations and Exercises on the Weather, J. A. Price, American Book Co.
- Laboratory and Field Exercises in Physical Geography, G. H. Trafton, Ginn & Company.
- Laboratory Manual for Physical Geography, F. W. Darling, Atkinson & Mentzer.
- Students' Laboratory Manual of Physical Geography, A. P. Brigham, Appleton.
- Introduction to Practical Geography, Simmons & Richardson, The Macmillan Company.
- Glencoe Loose-leaf Note-book Cover, Atkinson, Mentzer & Grover, Chicago.
- Teachers' Geography. A Syllabus and Notebook, M. S. W. Jefferson, Ypsilanti, Mich.
- Outlines, Suggestions and References in Commercial Geography, G. W. Sanford, Powers & Lyon, Chicago.
- Field and Laboratory Exercises in Physical Geography, J. F. Chamberlain, American Book Co.
- A Laboratory Manual for Physical Geography, F. W. Darling, Atkinson, Mentzer & Grover, Chicago.

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The Teaching of Geography

The New Basis of Geography, J. W. Redway, The Macmillan Company.
Topics in Geography, W. F. Nichols, D. C. Heath, Boston.
Teachers' Manual of Geography, J. W. Redway, D. C. Heath & Co.
Teaching of Geography, A. Geikie, The Macmillan Company.
Special Method in Geography, C. A. McMurry, The Macmillan Company.
Exercises in Geography, C. H. Leete, Longmans, Green & Co.
How to Study Geography, F. W. Parker, Appleton.
A Teachers' Manual of Geography, C. A. McMurry, The Macmillan Company.
Type Studies in United States Geography, C. A. McMurry, The Macmillan Company.
Excursions and Lessons in Home Geography, C. A. McMurry, The Macmillan Company.
Lessons in the New Geography, S. Trotter, D. C. Heath.

Reference Books for Teachers

Philippine Life in Town and Country, Le Roy, Putnam's Sons.
Japanese Life in Town and Country, Knox, Putnam's Sons.
Indian Life in Town and Country, Compton, Putnam's Sons.
Australian Life in Town and Country, Buley, Putnam's Sons.
Chinese Life in Town and Country, Bard, Putnam's Sons.
Italian Life in Town and Country, Villari, Putnam's Sons.
German Life in Town and Country, Dawson, Putnam's Sons.
Turkish Life in Town and Country, Garnett, Putnam's Sons.
Belgian Life in Town and Country, Boulger, Putnam's Sons.
Swedish Life in Town and Country, von Heidenstan, Putnam's Sons.
Russian Life in Town and Country, Palmer, Putnam's Sons.
Dutch Life in Town and Country, Hough, Putnam's Sons.
Swiss Life in Town and Country, Story, Putnam's Sons.
Spanish Life in Town and Country, Higgin, Putnam's Sons.
Austro-Hungarian Life in Town and Country, Palmer, Putnam's Sons.
Danish Life in Town and Country, Brochner, Putnam's Sons.
French Life in Town and Country, Lynch, Putnam's Sons.
Stanford's Compendium of Geography:
Africa, 2 Vol., A. H. Keane, Stanford, London.
Asia, 2 Vol., A. H. Keane, Stanford, London.
Australasia, Vol. I, A. R. Wallace, Stanford, London.
Vol. II, F. H. H. Guillemard, Stanford, London.
North America, Vol. I, S. E. Dawson, Stanford, London.
Vol. II, H. Gannett, Stanford, London.

Central and South America. 2 Vols., A. H. Keane, Stanford, London.
Europe, 2 Vols., G. G. Chisholm, Stanford, London.
A Glossary of Geographical and Topographical Terms, A. Knox, Stanford, London.
Britain and the British Seas, H. J. Mackinder, Appleton.
The Nearer East, D. G. Hogarth, Appleton.
Central Europe, J. Partsch, Appleton.
North America, I. C. Russell, Appleton.
International Geography, H. R. Mill, Appleton.
Lakes of North America, I. C. Russell, Ginn & Company.
Rivers of North America, I. C. Russell, Putnam's Sons.
Glaciers of North America, I. C. Russell, Ginn & Company.
American History and its Geographical Conditions, E. C. Semple, Houghton, Mifflin & Co.
Geographical Influences in American History, A. P. Brigham, Ginn & Company.
The Earth and Man, A. Guyot, Chas. Scribner's Sons.
Ethnology, A. H. Keane, Cambridge University Press.
Elementary Meteorology, F. Waldo, American Book Co.
Junior Geography, A. J. Herbertson, Clarendon Press, Oxford.
Physical Geography of New York State, R. S. Tarr, The Macmillan Company.
Elementary Meteorology, W. M. Davis, Ginn & Company.
National Geographical Monographs. Physiography of the United States, American Book Co.

REFERENCE BOOKS FOR PUPILS

Black's School Geographies, 9 Books, L. W. Lyde, A. & C. Black, London.
Black's Descriptive Geographies, F. D. & A. J. Herbertson, A. & C. Black, London.
A Reader in Physical Geography, R. E. Dodge, Longmans, Green & Co.
Uncle Robert's Geography, 4 Vols., Parker & Helm, Appleton.
Playtime and Seedtime.
On the Farm.
Uncle Robert's Visit.
A River Journey.
The Story of Geographical Discovery, J. Jacobs, G. Newnes, London.
The Story of the Atmosphere, D. Archibald, G. Newnes, London.
Home Reading Geographies, About the Weather, M. W. Harrington, Appleton.
How We Are Fed, J. F. Chamberlain, The Macmillan Company.

How We Are Clothed, J. F. Chamberlain, The Macmillan Company.
How We Are Sheltered, J. F. Chamberlain, The Macmillan Company.
Picturesque Geographical Readers, 6 Books, C. F. King, Lee & Shepard, Boston.
Geographical Series, 5 Vols., Longmans, Green & Co.
Longmans' Geographical Reader for South Africa, Longmans, Green & Co.
The South American Republics, Markwick & Smith, Silver, Burdette & Co.
Australia and the Islands of the Sea, Kellogg, Silver, Burdette & Co.
Views in Africa, Badlam, Silver, Burdette & Co.
Life in Asia, Smith, Silver, Burdette & Co.
Modern Europe, Coe, Silver, Burdette & Co.
Life in Asia, Smith, Silver, Burdette & Co.
Carpenter's Geographical Readers, 6 books, American Book Co.
Around the World in the Sloop "Spray," Capt. Joshua Slocum, Chas. Scribner's Sons.
American Indians, F. Starr, D. C. Heath & Co.
Strange Peoples, F. Starr, D. C. Heath & Co.
Appleton's Lessons in Geography for Little Readers, American Book Co.
Geography Primer, Cornman & Gerson, Hinds, Noble & Eldredge.
Longmans' Pictorial Geographical Readers, Longmans, Green & Co.
Two Girls in China, M. H. Krout, American Book Co.
Five Little Strangers, J. A. Schwartz, American Book Co.
Alice's Visit to the Hawaiian Islands, M. H. Krout, American Book Co.
Big People and Little People of Other Lands, E. R. Shaw, American Book Co.
Man and His Markets, L. W. Lyde, The Macmillan Company.
Around the World, 3 Vols., S. W. & C. F. Carroll, The Morse Company.
Youth's Companion Series, Ginn & Company.
Triumphs of Science, M. A. L. Lane.
Northern Europe.
The Wide World.
Toward the Rising Sun.
Strange Lands Near Home.
Under Sunny Skies.
Home Geography, C. C. Long, American Book Co.
The Frozen North, E. Horton, D. C. Heath & Co.
Fridtzof Nansen, J. B. Bull, D. C. Heath & Co.
Geographical Nature Study, F. O. Payne, American Book Co.

Geography for Young Folks, W. G. Baker, Educational Publishing Co.
Home Geography of New York City, Strabenmuller, Ginn & Co.
Geography of Commerce & Industry, Rochleau, Educational Publishing Company.
Guyot Geographical Reader & Primer, M. H. S. Pratt, American Book Company.
The Philippines, S. MacClintock, American Book Co.
Geography of New York. The State. The City. Smith & Perry, American Book Company.
Dutton's World at Work Series,
In Field and Pasture, M. B. Dutton, American Book Company.
Fishing and Hunting, Motte & Dutton, American Book Company.
Seven Little Sisters, J. Andrews, Ginn & Company.
The Story of Our Continent, N. S. Shaler, Ginn & Company.
Home Geography for Primary Grades, H. W. Fairbanks, Educational Publishing Co.
Great American Industries, A. Flanagan & Co.
Minerals, W. F. Rocheleau.
Products of the Soil, W. F. Rocheleau.
Manufactures, W. F. Rocheleau.

INSTRUMENTS FOR STUDY OF MATHEMATICAL GEOGRAPHY AND CLIMATE

Heliodon, Central Scientific Company, Chicago.
Sun Board, J. P. Goode, Central Scientific Company, Chicago.
Sun Dial, Central Scientific Company, Chicago.
Season Apparatus, J. L. Hammett Co.
Planetarium, Lang Planetarium Co., Chicago.

In addition exhibit was made of the more generally useful recent publications of the U. S. Geological Survey, including monographs, Geology Folios, Bulletins and Maps, and several special pieces of homemade apparatus for use in schoolroom.

THE USE OF REFERENCE BOOKS IN SCHOOLS

One of the most valuable parts of geography training is the ability to use reference books accurately, easily and effectively. This training can readily be given through the use of reference books accessible in the school library. Only the best reference volumes should be used, and the best should be selected not merely because they are interesting but primarily because they are geographically sound, information giving, and really supplementary to the class-room lessons.

PHYSIOGRAPHY OF NEW MEXICO

BY CHARLES R. KEYES
Socorro, N. Mex.

NEW Mexican physiography is remarkable because of its peculiar types and its wealth of detail. Lying within the semi-arid belt, geologic processes have operated in a manner entirely unknown in eastern United States. Nowhere else in the country do so many distinct geologic provinces meet.

General Considerations

The area of New Mexico embraces 122,580 square miles. In extent it is about equal to the combined areas of the six New England states, New York and New Jersey. The extreme points are about 560 miles apart; or a distance equal to that between New York and Cincinnati, or between Chicago and Washington.

New Mexico belongs to a part of the United States that is historically of great interest. Its northeastern part was included in the Louisana Purchase from France in 1803. The eastern half was annexed to the United States in 1845 as a portion of Texas. Most of the western half was ceded by Mexico in 1848. A small part of the extreme southwest was included in the Gadsden Purchase in 1853.

New Mexico rests on the backbone of the American continent. From the north extends southward into its boundaries the lofty Rocky range. In the west are the extensive and rugged Mogollon mountains. Through the central portion are numerous high block-ridges rising 3,000 to 5,000 feet above the surrounding country. Over the entire area are scattered volcanic piles, some of which are the most remarkable eruptive phenomena on the continent. Yet, among all these varied features the most dominant feature of surface relief in New Mexico is the plain.

Geographic Provinces

Main Characters. The newer geographic descriptions of regions do not take into account the colloquial districts which ordinarily are arbitrary sub-divisions, often with only vaguely defined boundaries. On the other hand, attempt is made to differentiate natural units having for their foundation distinctive physical features. Thus understood, a geographic province has certain characteristics of general surface relief, geologic formation, geotectonic arrangement, drainage features, climatic conditions, soil character, plant growth, economic resources, and harmonious environment for human habitation, that have unity and close relationships among them-

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selves, and that contrast strikingly with similar natural features possessed by neighboring provinces.

New Mexico presents four such natural provinces, all of which have more or less sharply defined boundaries according to the criteria already set forth. These great geographic provinces may be named as follows: (1) the Great Plains Province, occupying the eastern part of the region, east of the Pecos river; (2) the Rocky Mountain Province, reaching southward from Colorado in a long narrow tongue to the Glorietta pass; (3) the Mexican Tableland Province, in the south-central part; and (4) the High Plateau Region including all of the northwest.

These provinces are outlined in the accompanying cut.

Great Plains Province. The vast level plains which stretch out eastwardly from the Rocky Mountain front to the Missouri river, extend southward into Texas nearly to the Rio Grande. Of this broad plains region only a comparatively small portion is represented within the limits of New Mexico. The Llano Estacado and the plains to the north, across the Canadian river, constitute the westernmost extension of the Great Plains. This province comprises all of eastern New Mexico east of the Pecos river.

Genetically the intermontane plains of the Mexican Plateau properly belong to the same topographic feature, but for reasons hereafter stated, these are best considered in connection with the description of that district. While the two provinces were once continuous they have of late become separated by the gouging out of the great Pecos and Canadian valleys.

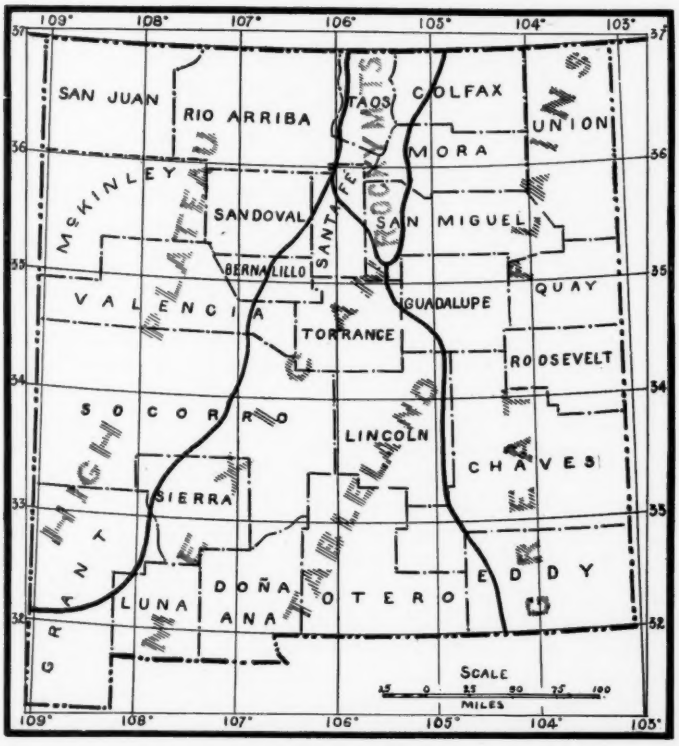
That part of the Great Plains which lies in New Mexico is a high, flat tableland which is inclined slightly to the southeast. It is apparently level and even as far as the eye can reach. Without trees and sparsely covered by gray grasses it presents the appearance of a vast desert, yet supplies pasturage for countless cattle and sheep. At the eastern margin of this province the elevation above the sea is about 5,000 feet, and the seaward inclination is between 8 to 10 feet to the mile.

With the exception of the valleys of the Canadian river and the Rio Pecos, the Great Plains province in New Mexico is unfurrowed by drainage-ways of any consequence. Where these two rivers traverse the province, deep valleys are hollowed out. Prominent escarpments form the sides of these valleys, and the plains surface comes to the very brink of the trough or canyon.

Rocky Mountain Province. The Rocky mountains end in northern New Mexico. Lofty ranges continue southward over the southern Colorado line. Southward the final expression is a pitching anticline which takes the last range beneath the level of the Mexican plateau. As in

Colorado, the Front range is bordered by foot-hills of the "hogback" type, formed by the upturned edges of hard sandstone layers along a profound faultline. The shape of this province in New Mexico is that of a broad wedge with the sharp end at the Glorietta pass.

The peaks of this province rise to an elevation of 13,000 feet. In the



heart of these mountains the Rio Pecos takes its rise. Before it leaves the province the stream cuts a deep valley, the western side of which is the magnificent Glorietta escarpment.

Mexican Table Land Province. This province embraces a large part of central and southern New Mexico. In the southwest it extends over the continental divide. The distinguishing features of the region are the vast, even tableland and the block-mountain ranges which rise 3,000 to 5,000 feet above the plains at the base and from 8,000 to 12,000 feet above tide-

level. These tilted piles of strata resemble, on a huge scale, ice-blocks in a river during the breaking-up in the spring.

To such intermontane plains the Spaniards early gave the name "Bolson," meaning purse. Most of the bolsons have no water-courses traversing them. The intermittent brooks and freshet torrents which come down from the mountains soon lose themselves in the porous soils and unconsolidated surface deposits.

Only a single through-flowing river traverses the region. This is the Rio Grande, which has completely destroyed the line of bolsons through which it flows. It now occupies a channel 1,000 to 2,000 feet below the original level of bolsons on either side. The broad valley has a diversified topography which is peculiarly its own.

High Plateau Province. The northwestern and western parts of New Mexico belong to the High Plateau region, which also embraces northern Arizona, southeastern Utah, and southwestern Colorado. In the main, the surface is a vast elevated plain, over which are scattered many volcanic hills and mountains. The continental divide passes through the central part of the New Mexican portion of the province. In its small features the whole country is fully as rugged as any mountain district, but of a very different type. In general, the entire region is a series of gigantic steps formed by the hard layers of slightly tilted strata. This rough surface is channeled by numerous canyons.

Plains of New Mexico

The foundation of the most characteristic feature of the New Mexican region is believed to be a general plain of degradation worn out on the beveled edges of the rock layers, and inclined slightly to the seaward. The period of the last great erosion was probably Mid-Tertiary or Miocene or possibly as early as Eocene.

As they exist at present there are four principal classes of plains: Plateau plains, bolson or intermontane plains, river plains, and alluvial plains. Plains of the plateau type are easily recognizable as distinct levels. Above the surrounding country they rise by abrupt escarpments. A number of these levels are of wide extent. In the northeast the Mesa de Maya stands 3,000 feet above the Ocate mesa and the latter 500 feet above the Las Vegas plateau. The last is 2,000 to 3,000 feet above the present river beds.

The bolsons are large even-surfaced plains, the foundation of which is a planation surface on beveled strata, and which are floored with loose gravels, sands, and clays. These plains are uncut by water-ways. The drainage from the high, often mountainous periphery, is centrifugal. Evaporation is so great that lakes are rarely found in the centers.

River plains border the great through-flowing rivers which have furrowed out wide flat-bottomed valleys with high canyon walls. Below the level of these canyons the present streams have carved out much deeper channels with broad alluvial plains on either side. The fourth type of plains is the alluvial plain already mentioned.

Mountain Systems

If the plain is the dominant feature of the New Mexican region, the mountain is the most conspicuous relief feature. Of all, it is the one feature which usually attracts the greatest attention. Genetically no less than seven distinct types are represented: (1) The mountains of compression find only a single example—the Rocky mountains. (2) Mountains of erosion are best exemplified by the Raton range, in northeast New Mexico. (3) The magificent Ortiz, Tuertos, San Ysidro, and Cerrillos groups are laccolitic in nature. (4) Block mountains, so characteristic of the Great Basin region, have the Sandia range for a type. (5) The Socorro mountain is an old Tertiary type of volcanic activity. (6) Isleta mountain is a low basaltic cone, a type which has many representatives in the region. (7) The Capulin mountain is a huge cinder cone rivaling that of Vesuvius and of very recent formation; it has a height of 3,000 feet above the surrounding plains.

These mountain ranges rise above the general plain, which itself is 4,000 to 7,000 feet above sea-level.

Rivers of New Mexico

Main Features. The drainage of the semi-arid region is wholly unlike anything that is found in more humid regions. That of New Mexico is one of the most remarkable known. Most of the precipitation sinks into the porous soil, and never reaches the large streamways.

The principal waterways are of three kinds. Their waters may be continuous, as in the case of most rivers, or they may be interrupted, or they may be intermittent.

On the whole the drainage is in a nascent stage. In a physiographic sense even the through-flowing streams are consequent rivers. In the bolson plains there are no permanent and distinct drainage-ways and the torrential waters flow down the slopes at the foot of the mountains in broad sheets.

Continuous Streams. Of the first class of drainage-ways are the Rio Grande, the Canadian, Pecos, and San Juan rivers. These are through-flowing rivers rising in the southern Rocky mountains. While these streams receive practically no additions from the tributaries in the country which they traverse, they have an interesting geological history. The huge

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valleys which they occupy appear to be, at first sight, out of all proportion to their size, as they are usually seen. Their high gradients, however, enable them to carry enormous quantities of water when the snows are melting in the mountains. Their effective erosive power is further shown in the turbid character of their waters and the vast amounts of silt which they carry at all times. The valleys of these streams are among the most interesting known. They lie many hundreds of feet below the general level of the plains around.

Interrupted Streams. Many of the drainage-ways are in some places flowing streams and in other places they have dry channels for a considerable portion of the year, the waters flowing in the sands and gravels beneath. The Rio Galisteo, the Rio Puerco, and a large number of other drainage-ways are of this order.

Intermittent Streams. This class embraces a very large proportion of the minor water-ways. They carry considerable amounts of water during heavy local rain-falls but soon cease flowing when the precipitation ceases. They thus are sporadic torrential channels. Throughout the region they are termed "arroyos" or dry creeks. Their gradients are high and in times of flowage carry along enormous amounts of gravels, sands and clays.

Many arroyos leading down from the mountains flow for a considerable portion of the year but upon entering the plains with their porous soils soon sink from view and become "lost rivers."

Lakes

Climatic conditions are not favorable to the existence of large bodies of quiet waters. While the centrally depressed bolson plains would be, under ordinary circumstances, lake basins, the present relationships of precipitation and great evaporation are such that when bodies of water are found in them they are comparatively small in size.

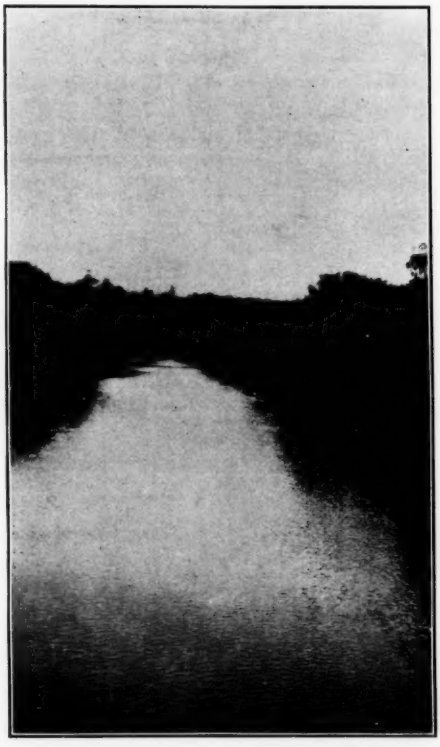
The lakes of the region are of two distinct types: mountain lakes and plain lakes. The latter are usually more or less temporary in character. There is also a class of lakes which occurs in connection with the bolsons that appears to have escaped the notice of writers on the region. For want of a better title they have been called Ephemeral lakes. They originate under abnormal though frequently recurring conditions.

Springs

The springs of New Mexico are numerous. Little need be said concerning them in the present connection as they are to receive special treatment shortly. Besides ordinary springs for domestic purposes there are many hot springs and mineral springs which are invaluable for medicinal purposes. Some of these already have a wide reputation for their curative qualities.

DESTRUCTIVE FARMING

BY G. E. FINCH
Marion, Iowa



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View of Turkey river where trees bordering the stream have been spared*

THOUGH Iowa is a prairie state, there are timbered areas to the northeast and east of considerable size. Perhaps the tense of this statement ought to be changed, for Iowa has been as prodigal of her scanty forest resources as have the better timbered states to the east and north. It is my purpose to give some of the effects caused by the deforest-

*Photographs by the Author.

ing of a part of the Turkey River Valley situated in Fayette County in Northeastern Iowa.

The topography of this region is that of the rugged, driftless area. The stream has cut a trench to a depth of three hundred feet through limestone and shales. The bluffs bordering it are in double series, an inner and an outer system, due to the alternating hard and soft formations through which the stream has carved its valley. These bluffs are mantled with loess, the well-known æolian deposit of friable yellow clay. The river bottom averages a half mile or more in width and is composed of two

Cultivated bottom lands along the river

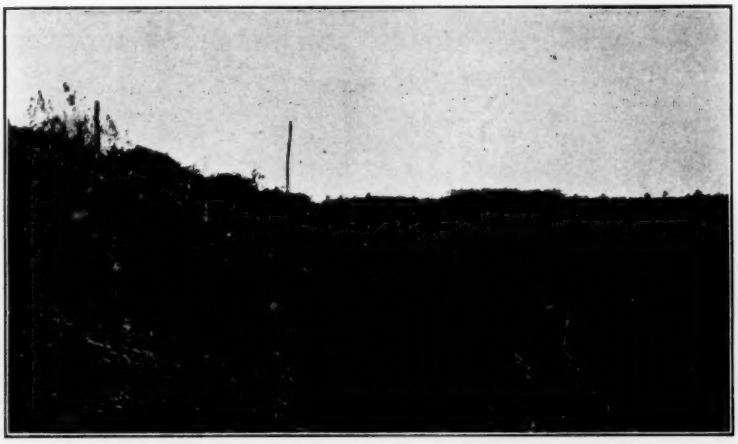
parts, a flood plain and a terrace, the latter a relic of the high water attending the melting of an ice sheet of the glacial age at the head of the river valley.

All these formations, loess-covered hills, terraces and flood plains, originally supported a heavy growth of the finest forest trees, such as the sugar maple, hickory, black walnut, linden, elm and several varieties of oak. Prior to the white man's coming there were occasional openings on the river bottoms that furnished a rank growth of "blue joint," but the hills were almost entirely forested. Two impervious shale formations, one above and one below the inner range of hills, furnish numerous springs. The river has a fall through this region of about eight feet to the mile, so that with a fair chance it can keep its bed well cleared of the finer detritus. Where the river swings clear to the edge of its flood plain, rock escarpments

of considerable height are exposed. All these features combine to make a valley which for scenery would not be a discredit to a state more pretentious along these lines than Iowa.

The Work of the White Man

Now as to the work done by civilized man in this valley. His occupation began about 1850. His first task was to clear the bottom lands; and the fine farms found there, with bounteous crops and thriving herds, go far to reconcile one to the destruction of the majestic groves. When the lands along the river had been reduced to cultivation the next lands to be

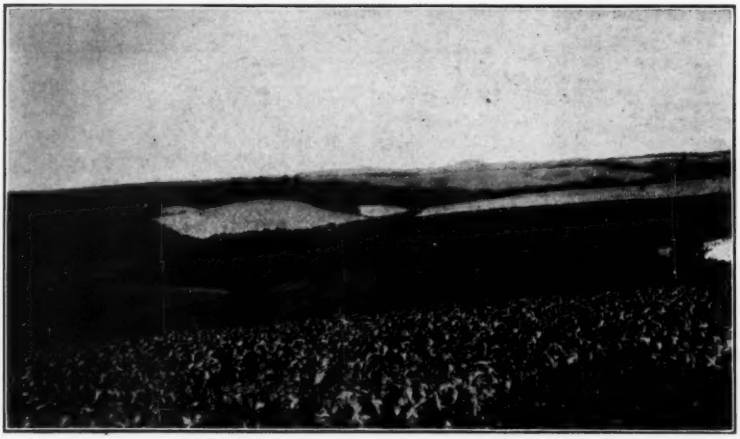


Clearing in progress on a steep slope. Not even a sapling or bush spared

cleared were those on top of the inner and outer ranges of bluffs. Both these regions are rolling, the former especially so. Still the loess soil is very fertile and better adapted to all sorts of seasons than the glacial soils of the county, so that these sections where not too rolling have produced a fair share of excellent farms. The clearing of these lands left only the steep faces of the two systems of bluffs still uncleared, and in recent years the forests there also have been largely cut away. If the land proved entirely too steep for tillage it was used for pasturage. One would have supposed that the owners would have spared the timber on the steep slopes at least, but the people have formed the habit of clearing off the forests, and besides, the price of wood and farm lands, too, kept getting higher and higher. Besides, had not the fathers of these forest destroyers, in Ohio and Indiana, girdled the finest forest trees, or cut and piled them in huge windrows and burned them in order to clear the land?

Results of the Deforesting

We will now notice some of the immediate effects of the clearing of the forests, beginning with the farms on the hills. After a few years of cultivation—years of handsome returns at first, too—the humus in the soil had largely disappeared and the tree roots rotted. Then the washing of ditches on the slopes began. Perhaps the first one started in an insignificant way in a furrow left by the plow, or between the rows in a cornfield, or down the wheel tracks where the farmer drove through his field. However it may start, when gullying begins on loess slopes of steep gradient, the process goes on until bed rock or base level is reached. The ditches

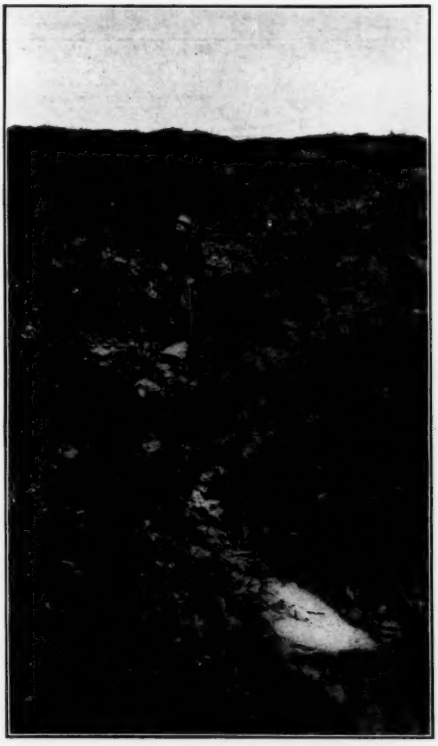


View over the hill tops showing how far the clearing has advanced

usually wash two or three feet deep the first year, but they continue to enlarge year after year until they are sometimes twelve or fifteen feet deep and as many feet in width. A man may take care to prevent ditches from starting in his own land, but a careless neighbor down the slope allows one to start below him that works its irresistible way up through his field. Often they branch out and sub-divide until they seem to occupy an entire field. Where lands are thus ditched they are no longer cultivable with modern farm machinery. The soil deteriorates greatly in fertility, too, from leaching and wearing away of its surface. Fields like these yield a smaller income per acre than can be obtained from the wooded lands where the timber is cut just rapidly enough to keep pace with its growth, and they would not sell for half the price of timber lands covered with "second

growth." Owners of the gullied lands are glad to take twenty dollars an acre for them as against an average value of farm lands in the county of probably three times that amount.

The ruinous effects wrought on the hillside farms are little more dis-



A fully developed ditch. It has cut down to bed rock and has sent out numerous side branches

astrous than on the river-bottom lands. With every large storm the lands along the river are flooded and crops in their season washed out by the torrents which pour down the denuded slopes so fast as to cause the river to burst its bounds. The bottom lands are subject to all the caprices of floods. They may have their soil washed away or buried under a three-foot layer of mud; or in a single storm a fertile field may be changed to a

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barren, sandy or rocky waste, uncultivable for years. Again the river or some tributary may change its course and undermine and carry away large amounts of valuable land. The river terraces, too high to be subject to overflow, are injured less, but they too are gullied or covered with the outwash from the ditches on the hillsides above. Timbered hills and

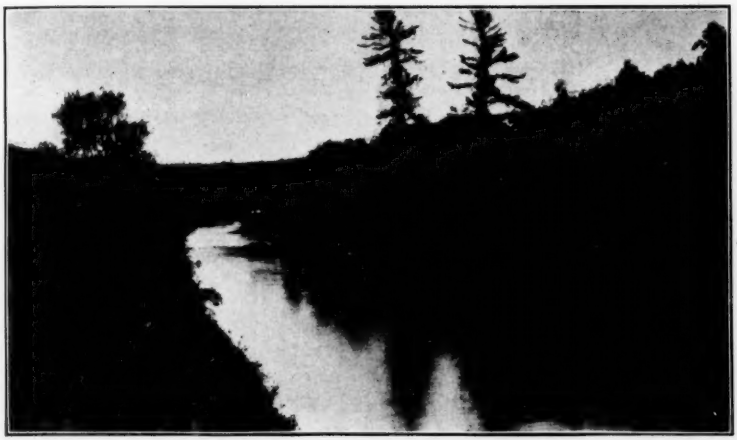
A ditch washed in the loess during the spring and summer of 1905

slopes to hold the water after a storm and to prevent the washing of detritus from the hills down upon the bottoms would prevent these ruinous effects.

Along with the deterioration of the land we find the river itself losing its charm. Its bordering fringe of native trees and grasses has nearly dis-

appeared. The farmer clears the land and plants his crops to the river's very brink. But the floods come and sweep away the crops and in their place sow the seeds of the rankest weeds and of the willow and cottonwood. These mongrel growths speedily monopolize any tract where given a foothold. They now occur nearly everywhere along the river, radically changing its appearance. Often acres are occupied by them in a single spot. The river no longer ripples in a limpid stream over beds of gravel and rock. Its channel is now silted up so that it is becoming a sluggish, dirty stream.

The thought of all this marring of the handiwork of nature at the hand



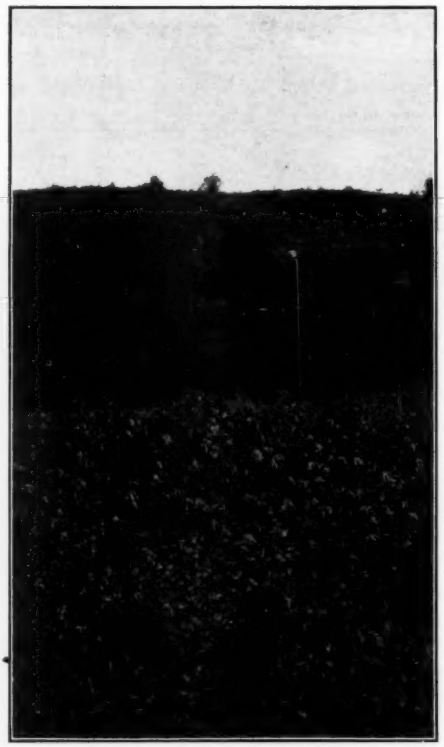
Another view of Turkey river. On the farther bank the native forest has been spared including two white pines. But observe how a fringe of weeds and willows is spoiling a magnificent rocky bank

of civilized man is almost enough to make one wish that these beautiful lands might have remained in the possession of the Indian. But the residents of this valley must not be singled out for especial criticism. There are some few who have carefully preserved goodly forests for use and beauty. Others have planted trees extensively. At the worst, the most reckless destroyers of forests among them can refer for endorsement to a National Government that seems determined to maintain a tariff on Canadian lumber until every native grove in the United States has disappeared.

The Remedy

What is to be done in such a case? The damage, though great, is not

irreparable. The high price of wood and lumber is compelling people to appreciate their forests as never before. Let the press and the school teach the principles of forestry and the love of nature and its beauties. Let the trees be restored to the hillsides and to the gullied lands by protecting all the efforts of nature and by replanting. Americans are surely too intel-



A cut-over hillside where the owner very wisely is allowing the timber a chance to grow up again

ligent to be permanently wasteful of their timbered wealth. If crowded Germany and France can spare land for trees to grow, and if they can teach their people how to grow them, surely as much can be done in America.

THE GEOGRAPHY COURSE IN THE OSWEGO STATE NORMAL AND TRAINING SCHOOL

BY AMOS W. FARNHAM
Oswego, N. Y.

PART V

THE WORK OF THE GRADES (Concluded)

Sixth Grade: Africa, Australia, South America and second treatment of North America

A. Africa.

I. Location. Locate Africa on the globe. A small globe on the desk of each pupil. Note that the equator passes through Central Africa and the Amazon Valley; that the parallel that passes through South Africa passes through La Plata Valley; and that the parallel that passes through North Africa passes through Virginia, Kansas, and California.

Note.—That the Atlantic Ocean is between Africa and the Americas.

In what great heat belts (zones) that encircle the earth is Africa? Study latitudinal climate with reference to temperature.

Locate Africa on Mercator's map of the world. What bodies of water almost surround it? (In bounding begin at the North and proceed clockwise.)

II. Form. What great land masses (continents) is Africa nearest like in form? What geometric form does Africa approach? In what heat belt is its broadest part? Its narrowest part?

III. Size. What continents are larger than Africa? What ones are smaller?

IV. Relief. (The elevations and surface undulations of a country. —*Guyot.*)

Study relief map of Africa.

1. Highlands.
   a. Plateaus. The great bulk of the continent is made up of plateau lands.
      (1) Abyssinian plateau. The most important highland of all Africa.
         (a) Location.

(b) Height. Nearly 8,000 feet above sea level. Some old volcanic cones attain a height of 16,000 feet.
(c) Area.

b. Mountains. A marked absence of mountain ranges.
(1) Atlas mountains. The one important mountain range.
(a) Location.
(b) Trend.
(c) Height. In western half the greatest height exceeds 14,000 feet.
(d) Slopes. Southern slopes very abrupt; northern slopes somewhat gentle.
(2) Drakensberg Range. Highest peak 11,000 feet.
(a) Location.
(b) Trend.

c. Mountain peaks. Old volcanic cones.
Kilimanjaro, highest peak, 19,200 feet; Kenia, 18,000 feet; Ruwenzori, 16,000 feet. Location of each.

2. Lowlands. Only a narrow fringe of low land which generally borders the plateau escarpments, although in places the highlands rise almost abruptly from the sea.
"Drawing a curve from the coast of the Red Sea in the east to the head of the Gulf of Guinea in the west, we may say that whereas land over 2,000 feet above the sea is the exception in the north, to the south it is the exception to find land below that elevation except close to the coasts."—*The International Geography*, p. 890.
N. B.—Note relation of altitude to temperature and rainfall.

3. The Great Rift Valley.
Location, origin, description.
Lake Tanganyika and Lake Nyassa lie in a portion of this valley.

V. Drainage—dependent on relief.
1. Mediterranean drainage.
a. The Nile River. Rises three degrees south of the equator, flows through Lake Victoria, receives the drainage of Lake Albert, is joined at Khartum by its

most important tributary, the Blue Nile, and still further north, 180 miles, by its last tributary, the Atbara. From this point to the sea, 1,800 miles, it flows on without receiving a single tributary.

(1) Location. The Nile River carefully traced from source to mouth.

(2) Length, 4,000 miles.

(3) Breadth. Normal maximum breadth below Khartum does not exceed 3,300 feet; at flood time maximum breadth does not exceed nine miles at any point.

(4) Navigability. Cataracts located.

(5) The Nile floods.
Time of occurrence, causes, effects. "Egypt the gift of the Nile."

(6) Distributaries.
The Rosetta and Damietta branches.

(7) The Nile delta.
Form, area, origin, habitability. The alluvium of the Nile Valley is a contribution from the Abyssinian plateau.

(8) The Nile Valley.
From the point of confluence of the Atbara with the Nile onward to the apex of the delta, theNile Valley reaches its maximum breadth in Egypt proper, in places being over 30 miles in breadth. This part of the "Valley is simply a cleft (rift) in the desert plateau, the cliffs on both sides of its alluvial plain rising in many cases to a height of over a thousand feet."
What isotherms for January cross the Nile Valley? What ones for July? See *Longmans' New School Atlas.*

(9) Locate Rosetta, Damietta, Alexandria, Port Said, Cairo, Assuan (Old Syene), Khartum, and give reasons for location of each. What are the great industries of the Nile Valley? What are the principal products? Children use the maps,

pictures, and text of their geographies that relate to the Nile Valley.

Read gazetteer and encyclopaedia articles regarding each.

Review of the Nile Valley in the lecture room with stereopticon slides.

2. Indian Ocean drainage.
   a. Zambesi River. Location, length, Victoria Falls, navigability, delta, and valley treated similar to Nile features.

      Locate Quilimane. Between what isotherms for January is the Zambesi Valley? Between what for July? What products of export come from the Zambesi Valley?
   b. Limpopo River.
      (1) Location.
      (2) Length, 900 miles.
3. Atlantic Ocean drainage.
   a. Orange River. Chief river of Southern Africa. Length, 1,200 miles. The Vaal is the chief tributary. The Orange River is "not much better than a huge torrent."

      What isotherm crosses the Orange River Valley in January? Between what isotherms in July?

      What are the great industries of South Africa? What are the important products?
   b. Congo River. Location, length (3,000 miles), Navigability (Stanley Falls and Stanley Pool). The Congo is only second to the Amazon in volume, and among African rivers next to the Nile in length.

      Note the industries and products of the Congo Valley. Read Livingstone's, Cameron's, and Stanley's explorations of the Congo.
   c. Niger River. Location, length (2,600 miles), delta. Locate Bonny (Idzo).

      Between what isotherms for January is all of the Congo Valley and the most of the Niger Valley? What isotherm crosses each in July?

VI. Arid regions.

1. The Sahara. The largest desert in the world.
   a. Boundary: Extends from the Atlantic Ocean to the Nile Valley; and from the Atlas mountains and their eastern continuations to varying, hence vague, southern limits. The Sahara includes the Libyan desert.
   b. Surface: Plateaus, mountain ranges, dunes, oases.
   Study the oases of Fezzan and Air. What is the chief product of the oases? Note that the Tropic of Cancer divides the Sahara into two nearly equal parts.
2. The Kalahari. Location. Note that the Tropic of Capricorn divides the Kalahari into two nearly equal parts.
   N. B. Half way between these two great arid regions is the equatorial rain belt which includes the greater portion of the Congo basin and the northern coast of the Gulf of Guinea where are found the great forests of Africa.
   For the month of January what isotherms cross the Sahara? What ones cross the Kalahari? Between what two is the equatorial rain belt? What isotherms for July cross these regions?

VII. Coast-line.

1. Conspicuous for absence of deep indentations (gulfs and bays), and therefore for marked land projections (peninsulas). The greatest projection on the Mediterranean coast is caused by the eastern extension of the Atlas mountains into the sea. The greatest indentations are the gulfs of Cabes and Sidra.
   On the Indian coast locate the projection that terminates in Cape Guardafui, and Delagoa Bay.
   On the Atlantic coast locate Cape of Good Hope, Bight of Biafra, Cape Verde, South Cape Blanco and Cape Blanco. Compare the coast-line of Africa with that of Eurasia; with that of North America.
   Note that the sea projecting its arms into a great land mass brings a much greater area of that land mass under the influence of oceanic climate; thus reducing the heat of summer and the cold of winter. Note that the heads of bays and gulfs usually furnish excellent harbors and hence favor commerce.

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Long narrow bays reduce distances to the sea, and in many cases do away with any considerable land transportation. Commerce is a great civilizing agency. With the exchange of commodities takes place an exchange of ideas.

Locate Suez, Gulf of Suez and the Suez Canal; Zanzibar Island and Zanzibar; Mozambique, Madagascar Island and Mozambique Channel; Delagoa Bay and Lorenzo Marques (the terminus of a railway connecting the Transvaal with the seaboard); Port Elizabeth and Algoa Bay; Cape Town and Table Bay; Monrovia, Freetown and Sierra Leone River; Morocco, Tangier, Algiers, Tunis, and Tripoli. In South Africa locate Johannesburg (gold fields), Kimberley (connected by railway with Cape Town), and Pretoria.

Cairo is the largest of African cities, being as large as Boston; Alexandria next in size is about as large as Pittsburg; Tunis is somewhat larger than Denver; Johannesburg exceeds Omaha; Algiers exceeds Nashville; Cape Town equals Wilkesbarre; Morocco has the same number of inhabitants as Portland, Me. The other cities each have less than 50,000 inhabitants. The oldest and largest cities are on the Mediterranean coast and in the Nile Valley. Why?

For what commodity of commerce is each city noted?

VIII. Means of communication.

1. Submarine cable loops that surround the continent.
2. Cape-Cairo telegraph line, and many other shorter lines.
3. Cape-Cairo railroad (not completed). Many short lines in both North and South Africa.
4. Suez Canal.
5. Coast steamers.
6. River steamers.
7. Caravans whose routes connect coast cities with the interior, especially with the oases.

IX. Political divisions of Africa. European "spheres of influence."

N.B.—Outline maps of Africa "edited" by pupils.

B. Australia.

I. Location: Latitudinal, longitudinal, climatic.

Note that the Tropic of Capricorn crosses Australia. In what part? In what heat belts is Australia?

II. Size. Compare with each continent studied.
III. Relief.
IV. Drainage.
V. Arid regions.
VI. Coast-line. Great Barrier Reef.
1. Gulfs, bays, peninsulas, capes, islands.
2. Continental shelf. Extent.
3. Coast cities located.
a. Their size and commercial importance.
VII. Great industries. Exports. Note the plants and animals that are peculiar to Australia.
VIII. Means of communication and transportation.
IX. Political divisions of Australia.

For fuller method of treatment, see outline work on Africa.

Study New Zealand; location, climate, relief, industries, products (agricultural, grazing, mining).

C. South America.

I. Location. Locate South America on the globe. A small globe on the desk of each pupil. Note that the equator passes through the mouth of the Amazon River on the east, and the City of Quito on the west. The equator passes also through the central part of Africa, crossing the meridian of Greenwich in the Gulf of Guinea. Note that the Tropic of Capricorn crosses the (nearly) central part of South America, the southern part of Africa, the island of Madagascar, and the continent of Australia. In what heat belts is South America?

Locate South America on Mercator's map of the world.

What bodies of water almost surround it? Note the Isthmus of Panama. What continents does it connect? What waters does it separate?

II. Form. Compare with Africa and North America. What geometric form does South America resemble? In what heat belt is its broadest part? Its narrowest part?

III. Size. What continents are larger than South America? What ones are smaller? Name all the continents in the order of size, naming largest first.

IV. Climate. Study relief map of South America.
1. Equatorial Calm Belt (Doldrums).

a. Location.
b. Temperature.
c. Direction of atmospheric current.
d. Rainfall.
e. Extent and migration.

2. Trade-wind belts.
Location, temperature, direction, moisture, velocity. Extent and migration of trade-wind belts.

3. Calms of Capricorn (horse latitudes).
Location, temperature, direction of atmospheric current, relation to rainfall, extent, migration.

4. Northwest anti-trades ("Brave west winds").
Location, temperature, direction, force, relation to rainfall, extent, migration.

V. Relief.

1. Primary highlands.
a. Andes mountains.
(1) Location.
(2) Direction of trend.
(3) Extent, length, width, height.
b. Bolivian plateau.
Location, area, height.

2. Secondary highlands.
a. Location—Guiana, Brazil.
b. Direction of trend.
c. Extent, height.

3. Mountain peaks.
Aconcagua, 22,860 feet.
Sorata, 21,500 feet.
Chimborazo, 20,500 feet.
Cotopaxi (highest known volcano), 19,613 feet.

4. Lowlands: The great river valley.

VI. Rainfall. See rainfall map to learn general distribution.

1. Compare rainfall of trade-wind and doldrum belts; compare these belts with belt of "brave west winds."
2. Compare eastern and western coasts and each with interior.
3. Compare highlands and lowlands.
4. Compare windward and leeward mountain slopes in trade wind belt and "brave west wind" belt.

5. Note change of climate of that region of country traversed by both migrating doldrums and trades.

VII. Drainage—dependent on relief.

1. Atlantic drainage.

a. Magdalena River.

(1) Location. Traced from source to mouth.
(2) Length, 1,050 miles.
(3) Navigability (620 miles).
(4) Delta.
(5) Chief tributary, the Cauca.
(6) Magdalena Valley.
Locate Cartagena (12,000 pop.).

b. Orinoco River.

(1) Location.
(2) Length, 1,350 miles. Carefully traced.
(3) Navigability—Orinoco Falls (Rapids of Atures).
(4) Delta.
(5) The tributary Cassiquiare; note its peculiar relation to the Rio Negro, hence to the Amazon.
(6) Orinoco Valley.
(a) Llanos region.
(b) Forest region.
(7) Locate Caracas.

c. Amazon River (largest river of the world).

(1) Location. The trunk stream and tributaries carefully traced.
(2) Length, 3,300 miles (statistics vary).
(3) Navigability (2,200 miles for steamships).
(4) Mouth, 50 miles wide.
(5) Marajo Island.
(6) Amazon Valley.
(a) Selvas. Products.

d. Para River.

Physically the estuary of the Tocantins. Sometimes regarded as one of the mouths of the Amazon. Forty miles wide where it enters the Atlantic.

(1) Locate Para (65,000 pop.).
The center of the river trade of the Amazon system. (Rubber, nuts, hides.)

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e. La Plata River System.
Uruguay, Parana, Paraguay Rivers.
(1) Location. System carefully traced.
(2) Length.
(3) Navigability.
(4) La Plata Valley.
(a) Pampas. Products.
(5) Locate,—
Buenos Aires, (560,000).
Montevideo (240,000).
Rosario (95,000).
La Plata (70,000).
Cordova (36,000).
Santa Fe (36,000).
Asuncion (35,000).

N.B.—Account for so many population centers in La Plata Valley and absence of them in Amazon Valley.

2. Pacific drainage.
Account for the absence of large rivers on the Pacific coast. What is the comparative velocity of its streams?

VIII. Arid regions.
1. Desert of Atacama (Nitrate of Soda).
2. Shingle desert.

Note.—In what wind belt is each? Then account for their being on opposite sides of the Andes.

IX. Coast-line.
Locate Gulf of Darien, Cartagena Bay, Point Gallinas, Gulf and Lake of Maracaybo, Trinidad Island (Asphalt), Georgetown (54,000 pop.), Paramaribo (30,000 pop.), Cayenne (10,000 pop.), Marajo Island, Cape St. Roque, Pernambuco (150,000 pop.), Bahia (200,000 pop., account for this unusual size of a tropical city), Santos Bay and Santos (important coffee shipping point), Rio Janeiro (500,000 pop.; nearly one-half of the coffee consumed in the world is shipped from this point) and Rio de Janeiro Bay, Cape Frio, Montevideo, Buenos Aires, La Plata, Strait of Magellan, Falkland Islands, Tierra del Fuego Island, Cape Horn. (Note the great extent of continental shelf extending from the Atlantic coast and account for the sinuosity of that coast.)

Locate Chiloe Island, Concepcion (24,000), Santiago (19,000), Valpariso (105,000), Callao (36,000), Lima (104,000), Guayaquil (45,000), Gulf and River of Guayaquil, Quito (80,000), Gulf of Panama. (Note the well nigh absence of continental shelf on the Pacific coast and account for the regularity of that coast.)

X. Great industries and export products: Agricultural, grazing, forest, and mining.

Note the plants and animals that are peculiar to South America.

XI. Means of communication and transportation.

XII. Political divisions of South America.

Outline maps of South America "edited" by the pupils.

D. North America—Second treatment.

N.B.—In the second treatment of North America the emphasis is placed on the earth side, not losing sight of the life side. Here *causes* are first considered. The work is more intensive, the reasoning faculty being appealed to in a greater degree.

I. Location: Use globes, large and individual, also Mercator's map of the world. Latitudinal and longitudinal; location with reference to hemispheres, zones, bordering oceans, and other continents.

II. Form.

III. Size: Compare with each of the other continents.

IV. Relief.

1. Western highlands. Use relief maps of North America.
   a. Mountain systems, ranges, noted peaks.
   b. Plateaus.
2. Eastern highlands.
3. Lowlands.
   a. Central plain.
   b. Coastal plains.

V. Drainage.

1. Arctic drainage.
   a. Mackenzie River (2,000 miles). Flows to higher latitudes, hence to colder regions throughout its course and into Arctic waters. Its upper course frees itself from ice earlier in the spring than does its lower course, causing overflows and floods in its lower course. Therefore the Mackenzie and other rivers belongu.g

to the Arctic drainage have little commercial value. To drain the land is their principal office.

2. Atlantic drainage.
   a. St. Lawrence River.
   b. Hudson River.
   c. Mississippi River.
   d. Many less important streams.

   Note the relative commercial value of these rivers based on their latitude, direction of flow, length of their navigable waters, their relation to other bodies, and the character of the larger bodies into which they flow.
3. Pacific drainage.
   a. Colorado River.
   b. Sacramento—San Joaquin River.
   c. Columbia River.
   d. Yukon River.

   Study the relation of these rivers to commerce.
4. Interior drainage.

   Commercial and irrigation values.

VI. Climate, determined by,—
   1. Latitude.
   2. Prevailing winds.
   3. Bodies of water.
   4. Ocean currents.

   Note temperature of each current (Gulf Stream, Labrador current, Japanese current) and direction of prevailing wind passing over them landward.

VII. Rainfall determined by,—
   1. Prevailing winds.
   2. Mountains and Plateaus.
   3. Bodies of water.

VIII. Coast-line.
   1. Compare different coasts with regard to direction, length, sinuosity; hence number of harbors, temperature of harbors in winter, nearness to foreign markets.

IX. Great industries determined by,—

Temperature, rainfall, soil, presence of forests, deposits of minerals, water-power, navigable waters.

X. Densely and sparsely settled regions and reasons therefor.

Study the greater Antilles, their location, size, relief, climate, principal products, and chief cities, noting the relation of Porto Rico and Cuba to our own government.

Seventh Grade: Detailed study of the United States. This is a somewhat exhaustive geographical study of our country which is considered to be of prime importance to intelligent, loyal citizens. Geographical reasons for the settlement and development of the various regions, for the origin and growth of cities, and for the commercial prosperity of our nation are carefully considered.

Eighth Grade: Second treatment of Eurasia and a series of lessons on the atmosphere and the ocean.

A. Eurasia. Treatment similar to second treatment of North America. Study the East India Islands.

B. Lessons on the atmosphere and ocean.
Many pupils never go beyond the eighth grade, hence never receive formal instruction in any branch of physical geography. In preceding grades the work has been very largely confined to a study of the land. These lessons will interpret many phenomena which otherwise might never be explained.

EDITORIAL

EQUIPMENT FOR GEOGRAPHY TEACHING

THE Editor of the JOURNAL presents this month a somewhat lengthy list of equipment available for geography teaching in elementary and normal schools, with the thought that such a list will be helpful to teachers who need to know what is available, that they may not buy equipment unwisely. This list is not intended to be complete in any way but is presented as showing what may be easily secured through American publishers and map concerns.

The list is made up on the basis of an exhibition recently held at the Teachers College, and to which all the well known publishers and map houses were asked to contribute. The list therefore includes the larger part of the materials considered by the publishing houses as their best and most attractive products, and hence can be relied upon as fairly representative and complete within certain limits.

The equipment for high school work in physical geography has not been included because materials for that kind of work are definitely outlined in the leading text-books and in other sources of reference.

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RECENT PUBLICATIONS

AN INTRODUCTION TO ASTRONOMY. By Forest Ray Moulton; pp. xviii+557. New York. The Macmillan Company, 1906.

A simple, well planned, graphically expressed and most helpful treatment of the elements of astronomy. Valuable to teachers of geography for its able presentation of many facts and principles necessary in geography. The chapters on the motions of the earth, time and tides are of special value to teachers of geography.

THE GEOGRAPHY AND GEOLOGY OF ALASKA, a summary of existing knowledge. By Alfred H. Brooks, Cleveland Abbe, Jr., and R. U. Goode. Professional Paper No. 45 of the United States Geological Survey, pp. 327. Washington, The Government Printing Office, 1906.

A study of the geography, history, geology, climate and topography of Alaska accompanied by numerous maps and illustrations and a large scale topographic map. Mr. Brooks, the chief author, is the leading authority on Alaska, and this report, written by him and his associates is the most authoritative account of Alaska extant.

PHILIP'S MODERN SCHOOL ATLAS OF COMPARATIVE GEOGRAPHY. Edited by George Philip, containing 136 maps and diagrams. London. George Philip & Son.

Contains numerous general world maps, a series of maps for each continent showing physical and political conditions, many larger scaled regional maps and smaller insets. The maps of Europe and the British Isles are especially full and valuable. The series devoted to the British Isles include a physical map, political map, a map showing agriculture, mining and fishing, one devoted to industries, one to languages and dialects, one to density of population, one to climate, one to geology, one to pastoral and agricultural regions, one to river basins and cotidal lines and eight special regional maps.

The maps are clear and usable, the book has an excellent index and deserves wide usage as a reference volume.

THE STORY OF RUSSIA. By A. Van Bergen; pp. 288. New York. The American Book Company, 1905.

An interesting, brief but evidently authoritative account of the geography and history of Russia accompanied by several maps and numerous illustrations.

NEWS ITEM

The JOURNAL notes with deep regret the death early in May of Professor Israel C. Russell, of the University of Michigan. Professor Russell, by his field work and explorations in the North West and in Alaska, and by his government reports and books, has done much for the cause of geography; and his volumes on the Lakes, Glaciers, Volcanoes and Rivers of North America, and his large volume on North America will long remain most necessary reference volumes for all teachers of geography.

NOTES

SOME NOTED IMPORTATIONS OF PLANTS.—The discovery of gold at Sutter's mill was the beginning of the great industrial development of the Pacific coast, but the introduction by the Catholic Fathers of a single forage plant—alfalfa—has turned two million acres of land into the most generally profitable farm area of this country.

These same Fathers brought with them to their missions olive cuttings, whose descendants to-day cover thousands of acres of the best tilled olive orchards in the world. A few orange cuttings from the east coast of Brazil, called to the attention of the world by an American woman, have grown until they number their descendants by millions and form what is one of the characteristic features of California—its orange groves.

The tomato, which before the war was a curiosity from Peru and was used to frighten slaves into obedience, because they thought it poisonous, was grown last year on over half a million acres of garden land.

The lima bean, whose arrival in this country no historian has considered worthy of chronicling, has so grown in importance since its introduction, some time about 1820, that to-day special freight rates are granted it between southern California and the Atlantic coast, and thousands of acres of land where the rainfall is extremely light are devoted almost exclusively to the cultivation of this Peruvian bean.

The potato from the highlands of Colombia and Peru; the rhubarb, from central Asia; the asparagus, from England, and even the celery of southern Europe, have all been, one after the other, introduced into our fields and gardens.

Though these great changes in the farm and garden areas of the country have been wrought in less than a lifetime, they have still been too slow, and to-day changes as far-reaching and important as the introduction of the olive or the orange are being brought about by government aid in a surprisingly short time.

—*National Geographic Magazine, April 1906.*

THE SMYRNA FIG.—One of the most fascinating events in the history of plant introduction was the introduction of the Smyrna fig industry. The Smyrna fig has always been considered the finest fig in the world, and beyond all competition; so it was natural that progressive Californians should wish to see if they could not grow it. Orchards were accordingly started in 1880. They grew well, but the crops of fruit they bore fell to

the ground when quite green, and it was evident that something was lacking to make the industry a success. A study of fig culture in Smyrna was made, and it was discovered that a process called caprification was necessary. This consisted in hanging in the trees of the true Smyrna fig the young fruits of another variety of figs that are not edible, but which contain thousands of microscopic wasp-like insects, called *Blastophaga.* These insects creep out of the caprifigs just at the time when the Smyrna figs are in bloom, and crawling into the latter, they fertilize the hundreds of small flowers of which the fig is composed, and instead of dropping off like unfertilized flowers, the Smyrna figs grow and ripen.

The caprifigs were accordingly imported as cuttings, but again the owner was disappointed when the trees bore, for it was discovered that they had left their tiny insects behind and were worthless. A final attempt was made through the combined efforts of the entomologist of the Department of Agriculture and Mr. W. T. Swingle, of the Bureau of Plant Industry, and in 1899, after nineteen years of effort, Mr. Roding's orchard of Smyrna figs was established. It is still the largest in this country and has been yielding large crops of delicious fruit. Sixty-five tons was the output for 1903, and though in its infancy, the California Smyrna fig industry is already supplying a portion of the figs now sold in our markets, and these are being put up with a cleanliness unknown in their native land.

—*National Geographic Magazine, April 1906.*

THE DATE PALM INDUSTRY.—The transfer from the great deserts of the old world to those of the new of the unique date industry is an accomplishment of which the government may well be proud. It is something that private enterprise would not have undertaken for decades to come, and the name of Mr. Walter T. Swingle will be always associated with this new industry. Though the attention of the public was first attracted to the possibilities of growing the foreign date palm in this country through chance seedlings that bore fruit, and through an early introduction of the pomologist of the department, it was the exploration trip of Mr. Swingle to the Desert of Sahara in 1899 that first proved the feasibility of starting commercial date plantations in Arizona and California. From the time when the first large shipment of palm suckers reached the Southwest until the present, the Office of Plant Introduction has had an explorer in some one or other of the great date regions of the old world gathering plants for the government plantations. To-day the list of introduced varieties numbers over 170, and more than 3,000 palms, large and small, have been imported and planted out. The best sorts from Egyptian

oases, selected kinds from the valley of the Tigris, the famous dates of southern Tunis and even the varieties from uncivilized Beluchistan, have been gathered into what can proudly be called the best collection of date varieties in the world. This search through the deserts of the world has revealed the fact that the dates of our markets are only one or two kinds of the host of sorts known to the true date eaters, the Arabs, and that those we prize as delicacies are by no means looked upon by the desert-dwellers as their best. The search has brought to light as well the hard, dry date, which Americans do not know at all, and which they will learn to appreciate as a food, just as the Arab has. Already Egyptian and Algerian imported palms have borne and ripened fruit, and many persons in close touch and sympathy with the work have sampled the first fruits of the newly introduced industry.

To all of us who have seen the date palm forests of the old world deserts and who have followed the progress of the experiments in this country, the landscape of the deserts of Arizona and California will not long be thought of without the presence of these stately plants that have so much that is biblical and ancient about them.

—*National Geographic Magazine, April 1906.*

THE NUMBER OF SHEEP AND THE PRODUCTION AND CONSUMPTION OF WOOL BY COUNTRIES.—Before agriculture was developed to any extent, sheep raising was followed by a large number of the dwellers in Asia and the more settled regions of the world. We read in Genesis that "Abel was a keeper of sheep" and that a large part of the wealth of the early patriarchs was made up of flocks of sheep.

The nature of sheep makes them capable of adapting themselves to different climates and conditions and well suited to the nomadic life common in many parts of Asia in earlier times. They supplied food and clothing to their owners and made a profitable return to the shepherd, the earliest and most honorable calling of man.

Sheep preceded civilization in many parts of the earth. Greece for many years was the sole possessor of sheep in Europe. They were introduced into Italy after the foundation of the Roman Empire and their conquests extended sheep raising to their colonies. Spain, which afforded abundance of pasture, had the honor of developing and improving its sheep, so that Spanish wool, even in Roman times, was famous for its quality. Pliny says that the finest wools in his time were obtained from Apulia on the Adriatic Sea.

Sheep in England date back to an early period. British wool was con-

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sidered a luxury even in Rome itself. From the thirteenth to the fifteenth century, England had a remarkable monopoly of wool. This had the effect of retarding the progress of its manufacturing industries, England being then mainly a rural community.

Merino sheep were brought to America by the Spaniards, and other European breeds by the earlier settlers of the United States. After numerous attempts extending through many years and attended with great difficulty, merino sheep were introduced extensively into the United States.

In Australia, Argentine Republic, Uruguay and South Africa, the introduction of European breeds has made sheep husbandry the most important business in those countries and has enormously increased their flocks.

The number of sheep in the world is estimated at about 480,000,000. The leading countries are given in the following table:

	Millions of Sheep		Millions of Sheep
Australasia	1905 — 83	Spain	1900 — 16
Argentine Republic	1905 — 78	South Africa	1904 — 14
Russia in Europe	1900 — 50	Austria Hungary	1900 — 11
United States	1905 — 38	Germany	1905 — 8
United Kingdom	1903 — 30	Algeria	1901 — 8
Russia in Asia	1900 — 20	Bulgaria	1900 — 7
France	1903 — 19	Italy	1900 — 7
India	1905 — 18	Roumania	1900 — 6
Uruguay	1904 — 17	Mexico	1903 — 4

In Australia the sheep are raised mainly on the grassy lands and drier downs south of the 20th parallel. In New Zealand the Canterbury plains in the middle island and the drier parts of the western mountains are the sheep raising regions. Australian wool is usually washed on the sheep runs and then forwarded to Sydney, Melbourne and other ports for export. In South Africa the grassy Karoos supply the needed pasture. In Argentina two-thirds of all the sheep are raised in the Province of Buenos Aires.

The merino sheep produces the finest wool, while cross breeds produce a coarser wool but are better for mutton. There has been a tendency of late in Australasia and the River Plate region, as well as other sheep countries, to breed sheep for the mutton. This is due to the adoption of refrigeration methods in transportation, enabling the carcass to be landed in Europe in good condition. There has been for years a steady decline in the number of sheep in the eastern part of the United States and in all European countries except Great Britain. This is due to the fact that agriculture is giving more profitable returns to farmers than sheep raising.—*Commercial America.*

CURRENT ARTICLES ON COMMERCE AND INDUSTRY.—

March:

Butter Producing Cows, The Jerseys, (Ill.) W. H. Dexter, *Farming.*

Child Labor, Laws Relating to, *Bull. of Bureau of Labor,* Jan.

Child Labor, The Cry of the Children, Mrs. John Van Vorst, *Sat. Evening Post,* March 10.

Coal and Iron, The World's Supply of, Cons. Gen. Mason, *Mo. Cons. and Trade Reports.*

Cochineal Insect, *Bull. of Bureau of Am. Republics.*

Cocoa Crops and Consumption, The World's, 1901-1904, *Bull. of Bureau of Am. Republics.*

Copper the Electric Metal, Chas. H. Cochrane, *Moody's Mag.*

Ireland, Deserted, (Ill.), P. F. Jones, *World To-Day.*

Jamaica, Captain Baker and, (Ill.), E. P. Lyle, Jr., *World's Work.*

Morocco, "The Land of the Extreme West" and the Story of My Captivity, (Ill.), Ion Perdicaris, *Nat'l. Geog. Mag.*

Russia's Great Resources, I. L. Lee, *Moody's Mag.*

Silk, Cultivation of in China, Cons. Haynes, *Mo. Cons. and Trade Reports,* Feb.

Slaughtering, The Packers and the People, J. Ogden Armour, *Sat. Evening Post,* March 3, 10, 24, 31.

Slaughtering, An Answer to Mr. Armour, John C. Scales, *Sat. Evening Post,* March 10.

Social Settlement, Fifteen Years at Hull House, (Ill.), Jane Addams, *Ladies' Home Journ.*

Speculation, Popular Fallacies of, Thos. Gibson, *Moody's Mag.*

Swine, The Possibilities of Breeding, A. J. Lovejoy, *Farming.*

Switzerland, Value of Geographical Position, *Mo. Cons. and Trade Reports,* Feb.

Texas and the Texans, (Ill.), M. G. Cunniff, *World's Work.*

April:

Alabama's Coal and Iron Industries, Thos. Gibson, *Moody's Mag.*

Botany, Our Plant Immigrants, (Ill.), David Fairchild, *Nat'l. Geog. Mag.*

Coal, The World's, *Moody's Mag.*

Consular Reform, C. A. Williams, *World To-Day.*

Cotton Culture, First Steps in, (Ill.), C. W. Burkett, *Farming.*

Forestry, A Country [China] That Has Used up Its Trees, (Ill.), Eliot Blackwilder, *Outlook,* Mag. No.

Furniture, The Truth About, (Ill.), W. A. Dyer, *Country Life in Am.*

Furniture, The Quest of the Colonial, Robt. and Elizabeth Shackleton, *Sat. Evening Post,* Mch. 31, Apr. 21.

Glass Industry, *Paint Oil and Drug Rev.,* Apr. 4.

India, The Canals and Railways in, L. H. Yates, *Sci. Am.,* Apr. 21.

Insurance, Special Number of, *World's Work.*

Negro, "Twenty-five Years of Tuskegee," (Ill.), Booker T. Washington, *World's Work.*

Rice Crop of British India, *Crop Reporter.*

Riches, Chas. W. Eliot, *World's Work.*

Steel, The Story of, (Ill.), Frank Fayant, *Success.*

Tanning: Why is the American Tanner so Successful? F. Kopecky, *Hide and Leather,* Apr. 21.

RECENT DECISIONS OF U. S. BOARD ON GEOGRAPHIC NAMES

Black: mountain, Mohave county, Ariz. (Not Ute.)

Carbon: peak, Elk mountains, Gunnison county, Colo. (Not Castle Peak, Mount Carbon nor Mount Ohio.)

Dead: mountains, San Bernardino county, Calif. (Not Black.)

Elk Point: township and village, Union county, S. D. (Not Elkpoint.)

Harney: peak, Black Hills, Pennington county, S. D. (Not Harney's.)

Marble: island, Sea Otter sound, southeastern Alaska. (Not Fox.)

Mohave: mountains, east of Colorado River, Mohave county, Ariz. (Not Chemehuevis nor Chimhuevis.)

Orca: bay, Prince William sound, Alaska. (Not Cordova.)

Poquoson: river, emptying into Chesapeake bay, Va. (Not Pocoson, Pocosin, nor Poquosin.)

Racetrack: peak at the head of Boulder creek, latitude 46°21′; longitude 113°02′; Granite county, Mont. (Not Mount Powell.)

Tsadaka: creek, tributary to Matanuska river, 20 miles above Knik arm of Cook inlet, Alaska. (Not Moose.)

Tunp: mountain range, above Rock creek, west of Hams Fork plateau, east of Sublets range, Uinta county, Wyo. (Not Campbell, Seedskeedee, nor Tetlick.)

ADJUSTMENTS AND READJUSTMENTS

ON a number of hills in southern Vermont are the foundations and tumbled walls of the old buildings of towns long since abandoned. Leading to these hilltop ruins are old roads now badly washed and often less passable than the nearby hillside. The hills rise to various altitudes from 100-1,000 feet above the valleys, and their forms are easily correlated with the mature dissection evidenced in all the valleys.

At present the villages, almost without exception, are in the valleys and near the streams, while roads, except where necessary, never cross hills, but wind delightfully around hill and spur, remaining always close to brook and stream. Noting the striking differences in the present and past locations of towns and roads and the consequent differences in the distribution of the population one is prompted to ask, Is the doctrine, stating man's adjustment to, and an agreement with his geographic surroundings, awry here? Has man in early or in later times gone sadly contrary to nature's dictum in locating his villages and laying out his roads? It would certainly seem so, at least until the student becomes familiar with the conditions.

Two hundred years ago, the hills were much as they are to-day, and the valleys led as directly from place to place as now; but then hill was relatively less timbered than valley, and the valley itself was almost impassable, because of swamp and rank undergrowth in the forest. Glaciers had interfered with drainage, producing lakes, marshes and bogs along the valleys, while little obstruction had been accomplished on the hills. The early settler's means of transportation were either his own legs or those of a horse, and only rarely the wheeled vehicle. For these reasons he chose to keep out of the valleys as much as possible and to travel high enough on the hillsides to avoid mud and slough.

Then, too, his well founded fear of the ubiquitous savage led him to dwell upon the hilltops where he could see approaching danger or be forewarned by distant curling smoke. No wonder he began his occupation of the territory from the hilltops. That process was in close adjustment to the conditions and necessities of the case.

His culture crept down the slopes; his mills possessed the streams; his energy cleared paths along the valleys. Better drainage recovered from pond and marsh, level areas of deep rich soil; while social and political exigencies gradually removed the savage.

With this development of valley industry, dependent upon the water-power, and the discovery of the better valley soils, came also the removal of the necessity of hilltop residence for protection, and of summit and slope highways for ready communication; and, at the same time, the wheeled vehicle, so much better adapted for valley travel, came into use. This latter may have been in part a response to the conditions of better roads, but was also an expression of better financial circumstances, just as is the two-seated phaeton in the prairie states, where not many years ago the lumber wagon was the best a farmer could afford and the only vehicle which could survive the winter roughness and the spring mud of the roads.

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And so, as the culture descended the slopes there followed the roads, the dwellings, and business houses, and finally the churches, until now, except along some of the divides, scarcely a building or passable road can be found near the hill summits. The whole *ensemble* of culture features is down in the valleys and the hills, where not retained in grass and pasture, are reverting to timber.

Without losing his connection with the first places which called forth his energy and furnished him sustenance, man has taken advantage of much of his environment which he was then unable to use and has completely changed his center of operations and form of occupation. Much more of the physiographic than formerly now influences him to advantage and in the readjustment he is more responsive to his surrounding conditions, having come into closer union with them. G. D. HUBBARD.

CORN THE FOOD STAPLE OF MEXICO.—Corn is to Mexico what oats is to Scotland, what rice is to the Orient. Mexico's laboring classes, the people who work in the mines, on the great plantations, and along the lines of the railways, subsist chiefly on corn; and a hardier, more muscular set it would be difficult to find.

While corn is employed for a number of food articles, the commonest one, which frequently forms the sole food of the very poor, is the tortilla or flat, unleavened corncake. Considerable labor is necessary to evolve the tortilla, and many women devote their days and a larger portion of their nights to its manufacture. The kernels are first soaked in lime water until they become soft, and then ground between stones into a paste, which is shaped into round, flat cakes, and baked on hot earthenware over a charcoal fire.

Indians will make long journeyings with a few dozens of tortillas slung over the arm for rations, and no other beverage save that supplied by the streams along their line of march. The methods for growing corn in Mexico are frequently the primitive ones in vogue three centuries ago, the plow being an inadequate, wooden contrivance, which does little more than scratch the surface of the ground, and the manner of planting, harvesting and storing being equally antiquated.

Yet so precious is the plant that not a particle is wasted, the stalks and the roots being used for constructing fences and houses, and often for fuel, while the fodder is fed to horses and cattle, who, in some regions, prefer it to hay.

The well being of Mexico's lower classes depends on the corn crop, and a few years ago when this failed, the Government removed the import duty on corn to avert a famine.—*Modern Mexico.*

THE NAVAHO INDIANS.—The principal industry among the Navahos is the growing of sheep. It is a poor family, indeed, that does not possess a flock of sheep and goats. Goats will be found in almost every herd. They are prized chiefly for their meat and skins. The goats are also desirable additions to the flocks from their habit of leading out and scattering the sheep sufficiently to graze over a large area, which is necessary for the best development of flocks in the Navaho country. It is estimated that about five acres of ground are here required to support a single sheep. The goats are also useful in protecting the sheep from attacks by wolves and coyottes. The goat will show fight while the sheep meekly submits to his fate.

The Navaho reservation is a large one, containing about 12,000 square miles, with an Indian population of about 16,000. The Navaho needs all of this land, though to the casual observer it is very difficult to understand why this should be so. One can travel all day long over this reservation and not meet a single Indian. Nevertheless, every acre that will grow grass they utilize for grazing their flocks and herds. They have many ponies and a few cattle, as well as sheep and goats. A few sheep require a large area to support them, and since they are not fed during the winter months, it is necessary that they should have winter pasture as well as pasture in summer. No one knows better than the Navaho how to use a barren desert to the best advantage.

The flocks, as a rule, belong to the women of the tribe who with the children take care of the sheep and goats. It is not an unusual sight for one crossing the reservation to see a small tot, not more than six years old, tending the flock all alone. Unlike many other tribes, the Navahos believe in teaching their children to work. A trifling, shiftless Navaho is an object of universal scorn and contempt. When they take their children to the Government schools the only request they have to make is that the authorities take good care of the children and teach them to work. The parents want them to learn to work like the white men—to do useful things in a skilful way.

The Navaho leads a wandering life. His occupation makes impossible any fixed habitation. He must follow his flocks, often many miles during a year. He lives chiefly out of doors with only the rudest sort of a shelter to protect him from the weather. He has no furniture, for he needs none. He sits and sleeps on the ground. A few simple cooking utensils, his blankets, and a few days' provisions make up his camp equipage. More than this would be a burden. His is the simple life and he wants only such things as contribute to his necessity. No luxuries for him! He hasn't the time to bother with them; he is too busy making a living. His wants are

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few; but he must keep busy to supply these few wants. It is not a matter of how well he may live, but whether he can live at all. Eternal hustle is the price of existence on a barren desert, where five acres of land are required to support a single sheep.—*The Southern Workman,* January, 1906.

THE TRANS-ANDINE RAILWAY.—"On the Chilean side, the road was completed from the seashore by way of Santiago and Mendoza to Salto del Soldado in August, 1893, and since then the Chilean Government, by contract, has extended the line from Salto del Soldado to Juncal, a distance of 27 kilometers, or 15 miles. Salto del Soldado is at a height of 1,262 meters, or 4,140 feet, above sea level, and Juncal is 2,222 meters, or 7,290 feet, above the sea. From Juncal, the point reached, to the boundary line between Chile and the Argentine Republic, the remaining distance is only 15 kilometers, or about 9 miles, and to reach the border the road will rise to a height of 3,189 meters, or 10,460 feet.

"Work at such an elevation is carried on with great difficulty. There are many tunnels and bridges, and the engineering difficulties were very great. In addition, it has been impossible to do much work during the winter season, as the region is then covered with deep snow. Great avalanches slide down the sides of the mountains, sweeping everything before them, and so the work has to be suspended during several months of the year.

"As early as 1888, when the two ends of this great railroad were 75 miles apart, travel began over the route. Passengers, mails, and a limited amount of freight were sent to Los Andes by train, and from there to the end of the road on the Argentine side were transported on mule back. From the Argentine end to the city of Buenos Ayres the track is in fairly good condition, and Pullman cars go through in about twenty-four hours.

"Yet transit over the route is only possible in the summer season. Beginning in December, trains run to the end of the line in January and February, but in March it begins to be difficult to get through and by the end of the month traffic is usually suspended. Thus the road, so far, has been available for business only a small part of the year, and considering the difficulties and expense of construction and operation it seems doubtful if it will ever be self-sustaining."—*Monthly Bulletin, International Bureau of American Republics.*